

Remarks

Claims 28-31, 36-42, 50, 51, 55, 57-62, 66, 69-71, 73-82, 84, 85, 87-91 and 93 are pending in the application.

The independent claims, and thereby all of the claims, have been amended to recite that and the zinc ions and the nickel and/or cobalt ions are provided with acetate as counter ion. Support for this amendment may be found, for example, at page 4, lines 11-15 of the specification.

Claims 94-97 are cancelled herein, since the subject matter thereof has been incorporated into the base claims in the present Reply. Claims 1-27, 32-35, 43-49, 52-54, 56, 63-65, 67, 68, 72, 83, 86 and 92 have been cancelled previously.

Applicants respectfully request reconsideration of the claims of the present application based on the foregoing amendments and the following points.

Applicants' Summary of Substance of Personal Interview

On 23 January 2008, Applicants' undersigned attorney and Examiner Bareford conducted a personal interview at the Examiner's office. During the interview, the claims and the references of record were discussed. Examiner Bareford indicated that a showing of unexpected benefits for features of the claims, such as pH, specific brighteners or other claimed features, would be helpful in distinguishing over the prior art. Applicants' attorney argued that there is no motivation or reason to select for use in immersion plating any particular one of the plethora of known electroplating brighteners, and that, in fact, there is no sound scientific basis for selection of any given brightener even for use in any given electroplating process. No agreement was reached as to allowability of the claims.

The foregoing constitutes Applicants' summary of the substance of the personal interview held on 23 January 2008, in accordance with MPEP 713.04 and 37 CFR 1.133.

Applicants note that the Examiner's Interview Summary form has not been listed on the PAIR site as of the date of filing the present Reply.

Rejections of Claims

The claims of the present application have been rejected as obvious over the asserted combination of U.S. Patent No. 2,580,773, to Heiman, with U.S. Patent No. 5,405,523, to Eckles, and further in view of U.S. Patent No. 2,892,760 to Gündel or U.S. Patent No. 3,960,677 to Hildering, and in some cases, with the addition of Haydu. In addition, the claims of the present application have been rejected as obvious over the asserted combination of JP 2000-256864 ("JP '864"), with U.S. Patent No. 5,182,006, to Haydu, and further in view of Gündel or Hildering.

Applicants respectfully traverse these rejections for at least the following reasons. None of the cited references disclose or suggest the criticality of the use of acetate as counter ion, the pH range or the specific inhibitors, all in combination with the other specified components of the claimed process. As shown by the experimental evidence set forth in the accompanying Declaration of Nayan Joshi, the other common counter ions give significantly inferior results. Similarly, as shown by the experimental evidence set forth in the accompanying Declaration of Nayan Joshi, the claimed pH range provides results not attainable just outside the claimed range. These surprising effects are neither disclosed nor in any suggested in the cited references, and would not have been expected based on the knowledge of a person of ordinary skill in the art at the time the invention was made. According, Applicants respectfully submit that the presently pending claims fully patentably distinguish over the prior art generally and the prior art of record in particular.

In addition, Applicants reiterate and incorporate herein by reference the previously submitted arguments against the combinations of Heiman and Eckles, and against the combination of JP '864 and Haydu. The recent addition of Gündel or Hildering fails to render obvious the presently claimed invention any more than did the originally and previously asserted bases for rejection of Applicants' claims. Applicants respectfully submit that the contended combinations of prior art references do not provide the requisite factual support for the asserted *prima facie* obviousness. Applicants respectfully submit that for the reasons shown in the accompanying Declaration of Nayan H. Joshi, even if a person of skill in the art would have attempted to make the combinations contended by the Examiner to have been obvious, the presently claimed invention would not have been obtained. Therefore, even if the

Examiner had stated a *prima facie* case of obviousness, any possible *prima facie* case of obviousness is fully rebutted by the facts shown in the Declaration submitted herewith. The facts in the Declaration submitted herewith show that, even combining the teachings of the references as contended by the Examiner, the asserted combination would not provide the claimed process, the present invention would not be obtained, and therefore, the presently claimed invention would not have been obvious.

Similarly, as shown by the Exhibit A to the Declaration of Nayan Joshi, i.e., the McFadden article ("A Mechanism for Brightening", Journal of the Electrochemical Society, 150 (9) C591-C599 (2003)), there is no fundamental basis for determining which additives to add or why, with respect to electroplating. Given this well known and accepted fact, there must be even less basis for selection of any given electroplating additive for transfer to and use in immersion plating, which operates in a fundamentally different way than does electroplating.

Accordingly, Applicants respectfully submit that the features of the claims, specifying the pH range from about 4.5 to about 5.5, the acetate counterion and the specific inhibitors, fully distinguish the presently claimed invention from the prior art.

Discussion of Facts Shown in Declaration of Nayan H. Joshi Under 37 CFR 1.132

Applicants submit herewith a further Declaration of Nayan H. Joshi under 37 CFR 1.132. Dr. Joshi is an inventor on the present application and is a person of skill in the art of metal finishing and, in particular, in the art of immersion plating, in the deposition of zinc and nickel and/or cobalt upon aluminum or aluminum alloy substrates. Dr. Joshi has previously submitted several Declarations in this application. Dr. Joshi is a person of skill in the art. The statements of both fact and opinion in Dr. Joshi's Declaration are based on his skill in the art combined with many years of relevant experience.

In summary, the facts shown in the Declaration clearly show that the contended combination of prior art references, asserted by the Examiner as having rendered Applicants' claimed invention obvious, would not have done so, because the contended combination would not have worked and would not have resulted in Applicants' claimed invention.

As set forth in paragraphs (3) and (4) of the Declaration, Dr. Joshi has reviewed the rejections, the prior art upon which the rejections are based and the Examiner's

rationalizations for making the contended combinations and for her conclusion that the claimed invention would have been obvious.

As set forth in paragraph (5), Dr. Joshi, as a person of skill in the art, strongly disagrees with the Examiner's conclusion that the claimed invention would have been *prima facie* obvious, based on the Examiner's contended selections, modifications and combinations of the disclosures of the various references.

As set forth in paragraph (6), Dr. Joshi cites and discusses the teachings of an acknowledged expert in the field of metal plating, G.B. McFadden et al. As stated by the McFadden et al. reference, there is no fundamental basis for determining which additives to add to a plating bath or why any given additive would be used in a particular case. As Applicants have repeatedly stressed throughout the prosecution of this application, there is absolutely no basis in fact for the Examiner's contention that it would have been obvious to select any particular electroplating brightener for use in the claimed immersion plating system.

As set forth in paragraph (7), the substantial differences between the zincating system of Haydu et al. and the presently disclosed and claimed invention would not lead any person of ordinary skill in the art to the presently claimed invention.

As set forth in paragraph (8), in order to show that the claimed invention would not have been obtained by the contended combination of prior art references, and to show that the claimed invention would not have been obvious, Dr. Joshi and his associates have conducted a series of experiments, reported in the following paragraphs of the Declaration. The experiments were intended to show that the use of the acetate counter ion, the claimed pH range, and the claimed inhibitor are all important aspects of the invention that combine to provide a process that is not only nonobvious over the prior art but also provides unexpected benefits in operation.

As set forth in paragraph (9), the tests that have been conducted in making the present invention and during prosecution of this application have been on two very different alloys of aluminum. These two alloys are considered both by Dr. Joshi and in the art generally to be representative of all alloys of aluminum and of un-alloyed aluminum.

It is noted that these tests have been undertaken to show that the claimed invention provides unexpected benefits, and that the limitations of the claims are

important in obtaining these benefits. Applicants have previously shown that the various contended combinations would not work, that compositions useful for immersion plating are not useful for electroplating, and conversely that components of compositions useful for electroplating would not be used in immersion plating based on their usefulness in electroplating.

As shown in paragraph (10) of the Declaration, only when acetate is used as the counter ion for the zinc and nickel, followed by electroless nickel plating, are satisfactory results obtained.

As shown in paragraph (11) of the Declaration, when acetate as counter ion is compared to sulfate and chloride as counter ion for zinc and nickel, only the acetate-based immersion plating baths provide satisfactory results in the 90° bend test, as shown in Exhibits B, C and D. The 90° bend test is a simple test to check the adhesion of the immersion and electroless plated metal layers to the base substrate. A flat thin coupon of the base metal (here the aluminum coupon) is used for plating with immersion plating followed by electroless nickel. The typical total plating thickness is 25-30 microns. After the plated coupon is subjected to the 90° degree bending, the outer and inner surfaces of the bent area (the "elbow") are checked visually for flaking/peeling. The results are shown in the photographs in Exhibits B, C and D, and are discussed the text of paragraph (11). As noted, from even a brief review of the Exhibits, it is quite clear that acceptable results are only obtained with a composition and process in accordance with the present invention.

As shown in paragraph (12) of the Declaration, when the claimed mercapto-substituted heterocyclic compounds were used as inhibitors in the claimed immersion plating process, superior results were obtained, as compared to the results with other additives or no additive.

In paragraph (13) of the Declaration, Dr. Joshi noted that results similar to those shown in paragraph (12) were shown in the specification of the subject application, in Tables I, II and III.

As shown in paragraph (14) of the Declaration, the claimed pH of the bath, i.e., from pH 4.5 to pH 5.5, is important. When similar baths at pH 4.0 and 6.0 are used, the results obtained are inferior to those obtained in the claimed range, i.e., at pH 5.0. The results of the varied pH tests are shown in Exhibits E, F and G, in photographs of the

90° bend test results. As noted, from even a brief review of the Exhibits, it is quite clear that acceptable results are only obtained with a composition and process in accordance with the present invention.

As stated in paragraph (15), the test results show that the presently claimed invention includes a number of features that provide unexpectedly good results. First, as shown by both the data in the application and the recently-obtained data presented above, use of the acetate salts of the metal ions provides an unexpected and significant benefit, when used together with the other elements of the presently claimed invention. Second, it is clear that the mercapto-substituted heterocyclic compounds provide a much improved performance compared to other additives. Third, it is clear that the selection of a chemical composition for use as a zincate replacement is not a simple matter of selecting any superficially similar prior art composition and arbitrarily modifying it. Fourth, as shown by the test results, the pH of the immersion bath of the present invention, i.e., pH from about 4.5 to about 5.5, is very important, and there is nothing in the prior art to suggest that this pH range would have any particular effect. Finally, the inhibitor of the presently claimed invention is used for the purpose of inhibiting dissolution of aluminum from the substrate, and for controlling the rate of zinc/nickel deposition, not for the purpose of brightening the deposit. There is no reason to add a brightener to an immersion plating bath such as that of the present invention.

Accordingly, based on the facts set forth in the Declaration of Dr. Joshi, and based on the presently pending claims, Applicants respectfully request the Examiner to reconsider and withdraw the rejections of Applicants' claims for the reasons set forth in the Office action to which this paper is responsive, and in the previous Office actions.

The Claims Are In Condition for Allowance

Applicants respectfully submit that, as shown in the Declaration, the presently claimed invention provides unexpected benefits as compared to the various combinations of prior art asserted against the claims, and that, as suggested by the Examiner during the personal interview of 23 January 2008, the importance of each of the selected brightener, the specific counter ion for nickel and zinc, and the pH of the immersion plating bath, in combination with the remaining features of the invention, must necessarily overcome any possible prima facie obviousness, and thereby clearly demonstrate the allowability of the presently pending claims.

Supplemental IDS

Applicants submit herewith a Supplemental IDS to cite the translation of JP 2000-256864, of which the original Japanese document was previously of record in this application.

Conclusion

In view of the facts shown in the Declaration of Dr. Joshi and the foregoing remarks, and in view of the presently pending claims, it is respectfully submitted that all of the claims presently in the application fully patentably distinguish over the prior art and are in condition for allowance. Notice to such effect is respectfully requested.

In the event issues arise as a result of the filing of this paper, or remain in the prosecution of this application, Applicants request that the Examiner telephone the undersigned attorney to expedite allowance of the application.

Should a further Petition for Extension of Time be necessary for the present Reply to the outstanding Office action to be timely filed (or if such a petition has been made and an additional extension is necessary) petition therefor is hereby made and, if any additional fees are required for the filing of this paper, the Commissioner is authorized to charge those fees to Deposit Account #18-0988, Docket No. ATOTP0104US.

Respectfully submitted,
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